ECOPY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Southwest Region Office
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August 22nd, 2024

Bradley Wynne, PMP
AECOM
13355 Noel Rd, Suite 400
Dallas, TX 75240
bradley.wynne@aecom.com

Re: Chevron Bulk Plant USA 1348 Updated Draft Remedial Investigation & Data Gaps Report

- **Site Name:** Chevron Bulk Plant USA 1348
- **Site Address:** 1656 E J St, Tacoma, Pierce County, WA 98421
- **Facility/Site ID:** 1234
- **Cleanup Site ID:** 3762

Dear Bradley Wynne (Project Coordinator):

This work is being done under Amended Agreed Order No. DE 7111 between Washington State Department of Ecology (Ecology) and Chevron U.S.A. Inc. (Chevron), and in compliance with the Model Toxics Control Act, Chapter 70A.305 RCW.

The following are Ecology's general comments to the updated draft Remedial Investigation (RI) and Data Gaps (DG) Report submitted to Ecology on April 23rd, 2024. These general comments are meant to address the large-scale concerns Ecology has with the submitted report. Please refer to the accompanying draft report for a more detailed review. The purpose of a remedial investigation is to collect data necessary to adequately characterize the site for the purpose of developing and evaluating cleanup action alternatives.

1. All proposed actions from the RIWP and associated addendums must be completed before the submittal of a draft RI. A draft RI should propose a complete site characterization, including proposed cleanup levels and points of compliance. If the site is not fully characterized, there needs to be a

proposed amendment to the RIWP and a schedule extension request. Due to the substantial remaining data gaps in site characterization, Ecology does not consider the site characterization complete based on the submitted draft RI & DG report, and therefore considers the report to be incomplete. Please refer to comments on pages 14, 15, and 16 of the accompanying draft report for more details.

2. Ecology is unable to locate some of the legacy data referenced in this report, including specific samples cited throughout the document. Additionally, Ecology was unable to locate evidence that the additive testing that is required according to Table 830-1 (WAC 173-340-900) has been fully completed based on the legacy data supplied in Appendix A. Please ensure that all required additive testing in soil and groundwater has been completed. This testing should be referenced in the body of the document and provided in Appendix A.
3. Ecology is not clear what cleanup levels are being proposed by this document. There needs to be some discussion about background levels and PQLs, as well. Please refer to comments on pages 14 and 15 of the accompanying draft report for more details.
4. Ecology has some concerns about the proposed changes to the previous RIWP addendum. Please refer to page 17 of the accompanying draft report for more details.
5. Ecology is concerned about the development of this project's schedule. Ecology understands though ongoing correspondence with Chevron's chosen project representative that an additional RIWP addendum is forthcoming which will provide a plan slightly altered from the previous addendum; ensure that there is a schedule extension request and complete schedule included with this new addendum.
6. Additional miscellaneous questions and updates found in the accompanying Word document.

Please incorporate these comments into a future draft of the RI & DG Report. Please incorporate comments #4 & 5 into a revised RIWP addendum to be submitted to Ecology within 30 calendar days of the receipt of these comments; that date is September 22, 2024.

If you have any questions, you may contact me at 564-669-4866 or thomas.praisewater@ecy.wa.gov.

Sincerely,

Thomas Praisewater

Thomas Praisewater, PE
Cleanup Project Manager
Toxics Cleanup Program
Southwest Region Office

Enclosure: Draft Remedial Investigation and Data Gap Report

By certified mail: 9489 0090 0027 6383 2222 57

cc: James Kiernan, PE, Chevron Environmental Management Company, jkiernan@chevron.com
Marian Abbett, PE, Ecology, marian.abbett@ecy.wa.gov
Ecology Site File

Enclosure

Updated Draft Remedial Investigation & Data Gaps Report

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AECOM

Updated Draft Remedial Investigation and Data Gap Report

Former Chevron Bulk Terminal, Facility No. 1001348
Tacoma, Washington
Facility/Site ID 1234, Cleanup Site ID 3762

Chevron Environmental Management Company (CEMC)

April 22, 2024

Delivering a better world

Updated Draft Remedial Investigation and Data Gap Report

Site Name:	Former Chevron Bulk Terminal, Facility No. 1001348
Site Owner:	GEO Group through the Correctional Services Corporation

Site Location Information:

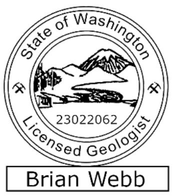
Site Address:	1656 East J Street, Tacoma, Washington, 98421
Latitude and Longitude:	47°14’56.90” N, 122°25’24.87W
Township and Range:	S4, T20N, R03E

Identification (ID) Numbers:

Ecology Cleanup Site ID:	3762
Facility Site ID:	1234

Quality information

Prepared by	Checked by	Checked by	Approved by
Tess Lydick, Geologist III	Brian Webb, RG, LG Project Geologist	David Raubvogel, LHG, LG Senior Geologist	Brad Wynne, PMP Project Manager



Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

# Hard Copies	PDF Required	Association / Company Name
-	1	Chevron
1	1	State of Washington Department of Ecology

Updated Draft Remedial Investigation and Data Gap Report
Former Chevron Bulk Terminal, Facility No. 1001348
Tacoma, Washington

Prepared for:

Chevron Environmental Management Company

Prepared by:

AECOM
aecom.com

Table of Contents

Figures

Tables

Appendices

Acronyms

AECOM	AECOM Technical Services, Inc.
AO	Agreed Order
AST	above-ground storage tank
bgs	below ground surface
BNSF	Burlington Northern Santa Fe
BTEX	benzene, toluene, ethylbenzene, xylenes
CEMC	Chevron Environmental Management Company
COC	constituent of concern
cm/sec	centimeters per second
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSM	conceptual site model
CULs	cleanup levels
Draft RI	Draft Remedial Investigation (Report submitted by Leidos Engineering, LLC in 2014)
DRO	Diesel Range Organics
Ecology	State of Washington Department of Ecology
EDB	ethylene dibromide
EDC	ethylene dichloride
ELLE	Eurofins Lancaster Laboratory Environmental
EPH	extractable petroleum hydrocarbon
FS	feasibility study
GRO	Gasoline Range Organics
GWBU	groundwater-bearing unit
HRO	Heavy Oil Range Organics
Leidos	Leidos Engineering, LLC
MTBE	methyl tertiary-butyl ether
MTCA	Model Toxics Control Act
NAVD88	North American Vertical Datum of 1988
No.	Number
PAH	polycyclic aromatic hydrocarbon
PID	photoionization detector
POC	point of compliance
PQL	practical quantitation limit
Property	Former Chevron Bulk Terminal (1656 E. J St., Tacoma, WA)
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
Report	Updated Draft Remedial Investigation and Data Gap Report
RI	Remedial Investigation
SAIC	Science Application International Corporation
SAP	Sampling and Analysis Plan

SIM	selective-ion monitoring
SPH	separate-phase hydrocarbon
TEE	terrestrial ecological evaluation
TPH	Total Petroleum Hydrocarbons
TPH-d	Total Petroleum Hydrocarbons – diesel-range
TPH-g	Total Petroleum Hydrocarbons – gasoline-range
TPH-o	Total Petroleum Hydrocarbons – oil-range
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VI	vapor intrusion
VPH	volatile petroleum hydrocarbon
WAC	Washington Administrative Code

1. Introduction

AECOM Technical Services, Inc (AECOM) has prepared this *Updated Draft Remedial Investigation* (RI) *and Data Gap Report* (Report) on behalf of Chevron Environmental Management Company (CEMC) for the Former Chevron Bulk Terminal (Property) number (No.) 1001348 located in Tacoma, Washington (**Figure 1**). This Report was prepared as a follow-up to the *Draft Remedial Investigation* (Draft RI) submitted by Leidos Engineering, LLC (Leidos) in December 2014 (Leidos 2014). Current and previous activities conducted for the RI are completed under Agreed Order (AO) No. DE7111 between the State of Washington Department of Ecology (Ecology) and Chevron U.S.A, Inc. in accordance with requirements set forth in Washington Administrative Code (WAC) 173-340-350, to investigate soil and groundwater conditions affected by previous Property activities. The 'Site' includes both the Property and areas off-Property which have been impacted.

This Report fulfills the submittal requirements described in WAC 173-340-350(4) for documentation of an RI conducted under the Model Toxics Control Act (MTCA) and is meant to characterize the nature and extent of petroleum hydrocarbon contamination in soil and groundwater based on current and historical data, identify soil and groundwater data gaps required for development of a *Final RI* and Feasibility Study (FS), and identify Site-specific risk-based cleanup levels (CULs).

1.1 Report Organization

This document is organized as follows:

- **Section 1 – Introduction.** Brief introduction to the Site and this Report.
- **Section 2 – Site Background.** Defines the Site and previously completed investigations and remedial actions.
- **Section 3 – Remedial Investigation Activities – 2010 through 2021**. Summary of all field activities completed as part of the RI.
- **Section 4 – Subsurface Conditions.** Discussion of the Site hydrogeology and geology.
- **Section 5 – Analytical Results and Conceptual Site Model.** Presents previous (Appendix A) and current soil and groundwater analytical results and applicable CULs along with the conceptual site model (CSM), review of proposed CULs and data gap analysis.
- **Section 6 – Conclusions and Recommendations.**
- **Section 7 – References.** Presents a list of references used in this Report.

2. Site Background

2.1.1 Site Location and Description

The Property is located in an industrial area at 1656 East J Steet in Tacoma, Washington (**Figure 1**), approximately 2,200 feet east of the Thea Foss Waterway and approximately 2,000 feet west of the Puyallup River, near the Commencement Bay Nearshore/Tide flats Superfund Site and approximately 1,500 feet northwest of a former coal gasification plant within the Tacoma Tar Pits study area (**Figure 1**) that operated from 1934 until 1956 (GeoEngineers, 1989; SAIC, 2010). The Property is bounded to the north by East F Street, to the east by East J Street, to the south by a Burlington Northern Santa Fe (BNSF) rail siding and undeveloped property, and to the west by a rail siding on the Steeler Inc. property (**Figure 2**A). The Property is in Township 20N, Range 3 East, Section 4 SE.

The 3.5-acre parcel (Parcel Number 03200440002) is presently developed with a 2,100 square foot office building, a Quonset hut structure, and paved parking in the eastern half of the Property. The western half of the Property is vacant and unpaved (**Figure 2B**). Many of the former bulk fuel terminal building foundation features (e.g., concrete slabs and footings) are still evident on surface grade across the Property (**Figure**

2B). A mobile trailer office and several shipping containers are also present on the Property. The Property is presently a vehicle and bus parking facility operated by Northwest Detention Center. The Property is relatively flat and ranges in elevation from approximately 13 to 15 feet, North American Vertical Datum of 1988 (NAVD88). A drainage pond (stormwater detention) is located adjacent to the southern property boundary. This stormwater feature is approximately 3 feet deep and has a drainage outlet on the eastern end of the pond which discharges to the storm sewer.

The former bulk fuel terminal operated from 1905 until 1988 and the Site boundary is defined in the AO as the extent of contamination caused by the release of hazardous substances at the former bulk fuel terminal (SAIC, 2010; Ecology, 2009). WAC 173-340-200 defines a Site as any area where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, placed, or otherwise come to be located. Therefore, the Site includes the former facility or property boundary and areas where impacts in soil and/or groundwater extent beyond the boundaries of the former facility.

RI activities have taken place on several adjacent parcels, including the Northwest Detention Center (owned by Correctional Services Corporation) to the east, Richlite (owned by Rainier Plywood) to the north, Steeler Drywall Supply (owned by Steeler, Inc.) and Port of Tacoma properties to the west (related to the former pipeline infrastructure) and a railroad switchyard owned by BNSF to the south (**Figure 2A**). These adjacent properties are zoned for industrial use (PublicGIS, 2023).

2.1.2 Ownership History

The Property and surrounding area were part of a tidal marsh at the mouth of the Puyallup River that was filled with sediment dredged from the river in the early 1900s (SAIC, 2010). A brief history of Property ownership is summarized below (Leidos, 2014):

- 1905: Standard Oil Company of California, who became Chevron U.S.A. Inc. in 1984, purchased the dredge-filled property and used it as a fuel storage and distribution facility until 1988.
- 1989 and 1990: All structures and underground pipelines on the Property associated with the former bulk terminal were decommissioned and reportedly removed.
- 1999: The Property was sold to Bowman Propane and, as condition of sale, a gravel cover was placed over the Property and a Warranty Deed was signed. The Warranty Deed included restricting the purchaser (Grantee including all future purchasers) from using the Property for residential purposes and restricting use of groundwater/surface water for consumption.
- 2004: The Property was acquired by Reinhard Petroleum who conducted business as Cornerstone Property Investments and leased the Property to Bowman Oil and Propane for staging of petroleum transport trucks. The property was later leased to a variety of occupants including Griffin-Galbraith Fuel Company, Lubking Petroleum, Mathews Heating Oil and Bowman Propane, until 2010.
- 2009: GEO Group purchased the Property in partnership with the Correctional Services Corporation.
- 2010 to present – Northwest Detention Center (Correctional Services Corporation) operates a bus and vehicle parking facility that is owned by Correctional Services Corporation of Boca Raton, Florida.

The former fuel storage and distribution facility had 13 above-ground storage tanks (ASTs), four underground storage tanks (USTs), two tanker truck-loading racks, two office buildings, several garages, a boiler house, and a barrel platform which operated from 1905 until 1988 (**Figure 2B**). The ASTs and USTs stored various products over the years including gasoline, diesel, light and industrial fuel oil, aviation gasoline, stove and furnace oil, and additives with tank capacity ranging from 10,000 to 1.6 million gallons. Lubrication oil was stored in barrels that were placed on platforms and fuel oil was transported by a pipeline from the Property to the pier area for loading onto ships (**Figure 2A**). All structures, docks, and some underground piping associated with the Property were decommissioned and reportedly removed by 1990

(SAIC, 2006). The four bulk petroleum supply lines in the northern area of the Property were removed and/or flushed, cleaned, and abandoned in place in 1989 (Hart Crowser, 1989).

2.1.3 Previous Environmental Investigations From 1984 Through 2010

Several environmental investigations performed between 1984 and 2010 identified the presence of Total Petroleum Hydrocarbons (TPH) in the gasoline range (TPH-g), diesel range (TPH-d), and oil range (TPH-o) in soil and groundwater at the Site (SAIC, 2010). Previous analytical results are presented in **Appendix A,** previous soil boring and groundwater monitoring well locations are presented in **Appendix B.** All of the previous site investigation locations are presented on **Figure 3A** and the previous investigation activities are summarized below:

- 1984: Ten (10) monitoring wells (C-1 through C-10) were installed, and separate-phase hydrocarbon (SPH) was detected in three wells, C-1, C-8, and C-10; trace oil film in C-1 and C-8 and 0.06' in C-10 (**Appendix B**) (Leidos, 2014; SAIC, 2006). Hydrocarbon odors were detected in all 10 wells; however, no soil samples were submitted for laboratory analysis (SAIC, 2006).
- 1989: Twelve (12) monitoring wells (MW-1 through MW-12) and eight soil borings (HB-1 through HB-8) were installed in response to a report of petroleum product entering a sanitary sewer on J Street (GeoEngineers, 1989; SAIC, 2006). Five additional monitoring wells (MW-13 through MW-17) were installed to monitor the shallow perched groundwater-bearing unit (GWBU) (also known as the "upper aquifer", "fill aquifer", and/or "shallow aquifer"), and 49 test pits (TP-1 through TP-49) were excavated to depths between approximately 5 and 10 feet below ground surface (bgs) (SAIC, 2006).
  - Soil samples from 20 locations detected constituents of concern (COCs) at concentrations above MTCA Method A CULs (SAIC, 2006).
  - TPH concentrations exceeded MTCA Method A CULs in 47 of the 49 test pits (Cambria, 1997; SAIC, 2006).
- 1990: Five monitoring wells (D-1 through D-5) were installed to monitor the sand aquifer (also known as the "lower aquifer" and/or "deep aquifer"), and 14 soil borings (HH-1 through HH-14) and 34 test pits (TP-50 through TP-83) were completed along the western and southern property boundary (GeoEngineers, 1989; SAIC, 2006).
  - SPH was detected in monitoring wells: MW-1, MW-2, and MW-4 (0.1 ft, 2.28 ft and 4.40 ft respectively) (Cambria, 1997).
  - Most soil samples analyzed had at least one detection of TPH except for samples from soil boring HH-14 and test pit TP-73 (SAIC, 2006).
- 1992: Five soil borings (B-1 through B-3, D-2A, and D-5A) were completed between 11.5 and 21.5 feet bgs and 20 test pits (TP-1 through TP-20) were excavated between 3.5 and 8.5 feet bgs (SAIC, 2006). Two soil boring locations (D-2A and D-5A) were completed as monitoring wells to replace previously abandoned wells (also referred to as D-2A and D-5A).
  - Polycyclic aromatic hydrocarbon (PAH) constituents were detected in soil above MTCA Method A CULs in two test pits (**Appendix A**) (Ecology, 2009).
  - Lead was above the MTCA Method A CULs in one soil sample at TP-20 (4 feet bgs) (GeoEngineers, 1993; SAIC, 2006).
  - PAH constituents were detected above MTCA Method A CULs in a groundwater sample from MW-17 (SAIC, 2006). TPH-g and/or TPH-d were detected above MTCA Method A CULs in groundwater samples from MW-8, MW-13, MW-14, MW-15, MW-17, D-1, and D-3 (GeoEngineers, 1993; SAIC, 2006).
- 1995: Five piezometers (P-1 through P-5) were installed in the northeast corner of the Property where petroleum was previously detected in groundwater. SPH was detected in P-2 and P-3 with measured thicknesses of 0.12 ft and 0.21 ft respectively. SPH was not detected in these wells during subsequent investigations (GeoEngineers, 1995).

Commented [TP1]: According to the data available in Appendix A, borings B-1 through B-3 seem to be sampled at 8 feet, and were only sampled for dibromoethane. Please confirm if this is the case or if there is missing data from Appendix A.

Commented [TP2]: P-1 through P-5 data is not available in Appendix A; please provide this data or update this paragraph.

– A test pit (TP-1-1) was excavated near the sanitary sewer line at the intersection of F and J Streets (**Appendix B**) to assess subsurface conditions and petroleum hydrocarbons were not detected in the soil (GeoEngineers, 1995; SAIC, 2006).

Commented [TP3]: I am not seeing these results in appendix A or the location of this test pit on any of the figures. Is this data available and can it be added to Appendix A and the relevant figures?

2.1.4 Previous Remedial Actions From 1989 through 2001

Previous remedial actions completed at the Site are summarized as follows:

- 1989: Approximately 2.65 feet of SPH was measured and an estimated 2.5 gallons was bailed from well MW-4 (SAIC, 2006). Additionally, an unknown quantity of SPH was bailed from previously installed well C-8 (Chevron Marketing Department, 1984; Gettler-Ryan, 2006; SAIC, 2006). Four petroleum supply lines under East 15th Street, which extended from the dock on the east shore of the Thea-Foss Waterway to the Site, were removed in May 1989 (SAIC, 2006). No evidence of substantial petroleum hydrocarbon contamination was observed in the excavated pipeline trench (Hart Crowser, 1989; SAIC, 2006).
- 1990s: Approximately 500 poplar trees were planted along the property boundary in the early 1990s to assess the ability for phytoremediation to minimize off-Site groundwater migrations and accelerate hydrocarbon biodegradation, however, these trees have since been removed from the Site (Cambria, 1997; SAIC, 2006). Biodegradation results and rationale for the removal of the poplar trees has not been located.
- 2001: Approximately 58 tons of petroleum-impacted soil was excavated from near the electrical and sewer lines at the intersection of F and J Streets and was disposed of at TPS Technologies in Lakewood, Washington (Delta, 2001; SAIC, 2006). Three stockpile soil samples were analyzed, and one sample had TPH-d concentrations above the MTCA Method A CUL.

Two pilot studies have been conducted at the Site which included usage of thermal oxidation and bioremediation technologies to reduce petroleum hydrocarbon contamination in soil, however, neither technology proved successful at completely remediating soil contamination (Cambria, 1997; SAIC, 2006). Documentation detailing methods, technologies, and results of either pilot study has not been located.

3. Remedial Investigations From 2010 through 2021

RI activities at the Site are being conducted under the AO (No. DE 7111) with Ecology dated March 1, 2010 (Ecology, 2010) to determine the nature and extent of hazardous substances in soil and groundwater, characterize potential risk to human health and terrestrial organisms, and develop the necessary data to prepare a FS and a draft cleanup action plan (dCAP) for the Site. RI field activities began following Ecology's approval of the RI Work Plan (June, 2010) and included advancing 74 soil borings and installation of seven monitoring wells by SAIC between 2010 and 2014 (Leidos, 2014) as summarized below:

- July 2010: Drilling of 17 soil borings (SB-1 through SB-17) and seven additional borings for installation of monitoring wells (D-6, D-7, and MW-18 through MW-22) and surveying of newly installed wells.
- October 2010: Drilling of 18 soil borings (SB-19 through SB-26 and SB-28 through SB-37).
- June 2012: Drilling of eight soil borings (SB-38 through SB-45) on two parcels owned by the Port of Tacoma along historical pipelines on the north and south side of each parcel.
- July 2013: Drilling of 14 soil borings (SB-46 through SB-60).
- July 2014: Drilling of 10 soil borings (SB-61 through SB-71) on the south side of the Steeler, Inc. property along historical (1921) pipeline and sampling of existing groundwater monitoring well RMW-1.

Additional soil and groundwater investigation was requested by Ecology to accomplish the 2010 RI Work Plan objectives. Multiple supplemental/addendums to the RI Work Plan were submitted to Ecology, which included additional borings, monitoring wells and completion of a tidal study (Leidos, 2017, 2018, 2020) as summarized below:

- 2016: A tidal study was performed to identify the relationship of the Site groundwater gradient and seawater intrusion associated with the tidal cycle in Commencement Bay. Water level measurements were collected in wells D-1, D-2A, D-3, D-6, D-7, MW-10, MW-14, MW-18, MW-19, MW-21, and MW-22 once per hour from September 1 through 29, 2016, with pressure transducers and electronic data loggers.
- 2017: Drilling of seven soil borings (SB-72 through SB-78) and two borings completed as monitoring wells (D-13 and D-14). D-14 was installed as a deep well to evaluate the vertical extent of the dissolved-phase impacts to groundwater and screened below 25 ft bgs.
- 2019: Drilling of eight soil borings (OB-1 through OB-8) and 16 additional borings for installation of monitoring wells (D-8, D-9, D-10, D-12, D-15, D-17, D-18, D-19, MW-23 through MW-26, MW-29 through MW-32).
- 2021: Drilling of eight soil borings (OB-18 through OB-25) and 11 additional borings for installation of monitoring wells (D-3A, D-13, D-22, D-24, D-25, D-26, D-27, MW-34, and MW-36 through MW-39). D-3 was also plugged and abandoned and replaced with D-3A as it appeared that D-3 was installed across both GWBUs.

Previous soil (2010-2021) and groundwater (1992 to 2022) analytical results are provided in **Appendix A.** The prior investigation boring, test pit and monitoring well locations are shown on **Figure 3A** and on a previous figure provided in **Appendix B**. Existing groundwater monitoring well locations and soil boring locations from 2010 to 2021 are shown on **Figures 3B** and **3C** and in **Appendix B.** Available soil boring and well logs are provided in **Appendix C**, and available previous laboratory reports are provided in **Appendix D**.

3.1 Methodology

The field activities performed by SAIC and Leidos between 2010 and 2021 were conducted in accordance with the RI Work Plan, *Quality Assurance Project Plan* (QAPP), and *Sampling and Analysis Plan* (SAP) (**Appendix E**), multiple RI Work Plan addendums, and the *Supplemental Remedial Investigation Work Plan* (SAIC, 2010, 2013; Leidos, 2015, 2016, 2018, 2020). These work plans specified sample collection methods, sample locations, analytical methods, reporting limits, quality assurance measures to be implemented, as well as other pertinent sampling procedures. The RI related field activities completed by SAIC (from 2010 through 2013) and Leidos (from 2014 through 2021) are summarized in the following sections.

3.1.1 Soil Investigations

3.1.1.1 SAIC Soil Borings and Sampling

On-Property soil borings were advanced using a combination of air knife and hand auger for the first 8 feet bgs, and either hollow-stem auger drilling methods or Geoprobe® direct push methods to the total depth of the boring (Leidos, 2014). Off-Property soil borings were advanced using a hand auger or air knife to between 5 to 6.5 feet bgs to assess if petroleum contamination was present on the north and south side of parcels owned by the Port of Tacoma and Steeler, Inc. in the vicinity of historical petroleum pipelines west of the Property, (Leidos, 2014). Borings were advanced until field screening evidence of petroleum hydrocarbon-impacts in soil was no longer apparent, or refusal conditions were met. The soil conditions and field screening findings (e.g., odor, sheen, and photoionization detector (PID) readings) were recorded on boring logs that are presented in **Appendix C**.

At least one soil sample was collected from each boring based on field screening observations and submitted for laboratory analysis (Leidos, 2014). Additional soil samples were collected in borings where petroleum impacts were noted at different depth intervals, or the vertical extent of impacts warranted additional characterization (Leidos, 2014). The samples were analyzed by Eurofins Lancaster Laboratories Environmental, LLC (ELLE [formerly Lancaster Laboratories]) of Lancaster, Pennsylvania under proper chain of custody protocols.

On-Property and off-Property soil samples were analyzed for:

- TPH-g by Ecology Method NWTPH-Gx,
- TPH-d and TPH-o by Ecology Method NWTPH-Dx with silica gel cleanup, and
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by United States Environmental Protection Agency (USEPA) Method 8260B.

Selected on-Property soil samples were also analyzed for:

Commented [TP4]: It is unclear how soil samples were selected for additional analysis. While not every sample needs to be tested for every contaminant of concern, please provide a summary of the methodology for how samples were selected for additional analysis and how this select group is representative enough to provide a satisfactory level of site characterization.

- n-hexane and naphthalene by USEPA Method 8260B,
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by USEPA Method 8270 using selective-ion monitoring (SIM),
- Volatile petroleum hydrocarbons (VPH) by Ecology Method WA-VPH,
- Extractable petroleum hydrocarbons (EPH) by Ecology Method WA-EPH,
- Lead by USEPA Method 6020, and
- Ethylene dibromide (EDB) and ethylene dichloride (EDC) by USEPA Method 8260B.

Based on the results from soil samples collected during RI soil sampling, the COCs included: TPH-g, TPH-d, TPH-o, and benzene (Leidos, 2014). The prior soil analytical results are summarized in **Appendix A** and available analytical reports not previously submitted are presented in **Appendix D**. The soil boring locations are shown on **Figures 3A** and **3B**.

3.1.1.2 Leidos Soil Borings and Sampling

The borings were advanced to at least 8 feet bgs by air knifing with a vacuum truck or using a stainless-steel hand auger (Leidos, 2017). The borings were then advanced to the total depth of the boring using Geoprobe direct push drilling methods (Leidos, 2017).

The soil conditions were noted, and soil samples were collected for field-screening and laboratory analysis (Leidos, 2017). The field screening findings (e.g., PID and sheen testing) were recorded on boring logs, copies of which are presented in **Appendix C**.

A minimum of two soil samples were collected from each boring for laboratory analysis: one from the capillary fringe, and the second from the bottom of the boring to assess the vertical extent of petroleum-hydrocarbon impacts (Leidos, 2017).

Select soil samples were submitted to ELLE for the following analyses:

- TPH-g by Ecology Method NWTPH-Gx,
- TPH-d and TPH-o by Ecology Method NWTPH-Dx with silica gel cleanup,
- BTEX by USEPA Method 8260,
- cPAHs by USEPA 8270, and
- Moisture by SM 2540 G-1997.

These analytical results are summarized in **Appendix A** and the available analytical reports are presented in **Appendix D** if not previously submitted. The soil boring locations are shown on **Figure 3B**.

3.1.2 Groundwater Monitoring Well Installation and Sampling

3.1.2.1 SAIC Well Installation and Sampling

Groundwater monitoring wells were installed using hollow stem auger drilling methods. The monitoring wells were installed within the shallow perched GWBU (MW-18 through MW-22) and the deeper sand aquifer (D-6 and D-7). The perched GWBU wells were completed to a total depth of 9.5 feet bgs and screened from 3 to 9 feet bgs, except for MW-22 which was completed to 8.5 feet bgs and screened from 3 to 8 feet bgs. Sand aquifer groundwater monitoring wells (D-6 and D-7) were completed to 20.5 feet bgs and screened from 15 to 20 feet bgs (Leidos, 2014). The available monitoring well boring logs and construction details are presented in **Appendix C**.

Groundwater levels were measured, and samples collected from the Site monitoring well network between 2010 through 2013 as part of the RI.

Groundwater samples were collected using low-flow purging and sampling techniques in accordance with the SAP. The groundwater samples were analyzed by ELLE under proper chain of custody protocols for the following analytes (Leidos, 2014):

- TPH-g by Ecology Method NWTPH-Gx,
- TPH-d and TPH-o by Ecology Method NWTPH-Dx,
- BTEX, methyl tertiary-butyl ether (MTBE), EDB/EDC, naphthalene, and n-hexane by USEPA Method 8260B,
- Dissolved lead by USEPA Method 6020, and
- cPAHs by USEPA Method 8270 SIM.

Groundwater sampling results indicated that TPH-g, TPH-d, TPH-o, benzene, and total xylenes were above MTCA Method A CULs (Leidos, 2014). Analytical results are summarized in **Appendix A** and the monitoring well locations are shown on **Figure 2A** and **2B**.

3.1.2.2 Leidos Well Installation and Sampling

Additional monitoring wells were installed by Leidos between 2018 through 2021 consistent with the drilling methods described above.

The monitoring wells (MW-23 through MW-39 and D-9 through D-27) were constructed with pre-packed Schedule 40 poly-vinyl chloride (PVC) casing and 0.010-inch factory slotted screen with 2/12 sand filter pack. Each monitoring well was completed at the ground surface with a flush-mounted, traffic-rated well-box. Wells were developed using pump and surging method until water was clear and free of sediment (Leidos, 2017). Available monitoring well construction logs are included in **Appendix C**.

Groundwater monitoring of the new and existing wells was performed from 2019 to 2022 using low-flow purging and sampling techniques. The samples were analyzed for:

- Gasoline Range Organics (GRO) by ECY 97-602 NWTPH-Gx,
- Diesel Range Organics (DRO) and Heavy Oil Range Organics (HRO) by ECY 97-602 NWTPH-Dx extended,
- BTEX by SW-846 8260B,
- MTBE by SW-846 8260B, and
- PAHs by USEPA Method 8310.

3.1.3 AECOM 2023 Groundwater Monitoring and Well Resurveying

AECOM assumed management of the Site groundwater monitoring and completion of the additional RI activities in 2023. The current quarterly groundwater monitoring program is presented in **Table 1**. As requested by Ecology in mid-2023, analysis for silica-gel cleanup for TPH-d and TPH-o was also added to the sampling plan, for the third and fourth quarter sampling events in 2023.

The monitoring well network was resurveyed in 2023 by a Washington State licensed land-surveyor to re-establish a common elevation datum for the entire Site. Monitoring well top of casing elevations were measured to the nearest 0.01-foot, NAVD88. The resurveyed top of casing elevations are summarized in **Table 2**. Quality assurance/quality control (QA/QC) samples were collected and analyzed by SAIC and Leidos per the SAP and QAPP (**Appendix E**) and by AECOM during the 2023 groundwater monitoring. Duplicate soil and groundwater samples were collected at a rate of one per 20 samples collected for each media. Additional QA/QC samples included (1) one trip blank to accompany each sample cooler containing water samples, and (2) equipment rinse samples at a rate of one per sampling activity to verify equipment decontamination procedures. Trip blank and equipment rinse QA/QC samples were analyzed for GRO by NWTPH-Gx, and BTEX by SW-846 8260B. Field duplicate samples were also analyzed for TPH-d and TPH-o by NWTPH-Dx.

Commented [TP5]: I do not see these results in appendix A.

Commented [TP6]: According to Table 801-A, need to sample for EDB/EDC and naphthalene. If this has already been done to a satisfactory level, please include an explanation here along with a reference to the requisite data.

4. Subsurface Conditions

4.1 Geology

The subsurface soil conditions are depicted on the cross-section on **Figure 4**. The Site is underlain by dredged fill material consisting of fine to medium sand with varying amounts of silt and marine shell fragments and ranges from approximately 3.5 to 11 feet in thickness. The fill is underlain by approximately 3 to 6 feet of tidal flat deposits consisting of silt with varying amounts of sand, organic matter, and clay. An approximately 5- to 70-foot-thick layer of fine to medium sand with varying amounts of silt underlies the tidal flat deposits.

4.2 Hydrogeology

Two water-bearing zones have been identified beneath the Site: an upper water bearing zone, referred to as the perched GWBU and a lower confined to semi-confined water bearing zone, referred to as the sand aquifer. The unconfined perched GWBU lies within the dredged fill material and groundwater levels in this unit vary seasonally. The perched GWBU is separated from the underlying water-bearing zone by an aquitard of mostly silt (Leidos, 2014). Groundwater in the perched GWBU is not believed to be tidally influenced and appears to mound and flow radially away from the center of the Site, mostly to the north, northeast, and east (**Figure 5A** and **5B)**.

The sand aquifer is present within a fine to medium sand layer and is semi-confined to confined. The sand aquifer is believed to be tidally influenced by fluctuations in the Puyallup River and the Thea Foss and Wheeler-Osgood Waterways. Potentiometric surface elevations were measured at wells within the sand aquifer through several tidal cycles in 1992, in which a time lag of approximately 1 to 3.5 hours was observed between the tidal maxima or minima and the corresponding response in the monitoring well (GeoEngineers, 1993). Data collected in 1992 suggests the inferred gradient within the sand aquifer during high tide is towards the northeast and northwesterly during low tide (GeoEngineers, 1993). Groundwater elevation data measured during high and low tides in October 2023 indicate an apparent groundwater divide within the sand aquifer near the center of the Site. West of the divide groundwater flow is generally to the northwest and east of the divide it is generally to the east during high and low tidal conditions (**Table 3; Figures 5C**, **5D** and **5E**).

A tidal influence study was performed in September 2016 to evaluate groundwater flow patterns and tidal influence on both the perched GWBU and sand aquifer (Leidos, 2017). Water level measurements were collected at wells MW-10, MW-14, MW-18, MW-19, MW-21, MW-22, D-1, D-2A, D-3, D-6, and D-7 once per hour for the entire month. Water level data and potentiometric maps developed by Leidos are included in **Appendix B.** The findings indicated that the groundwater flow within the perched GWBU was generally northeasterly during low and high tide and within the sand aquifer fluctuated between northwesterly during low tide and northeasterly during high tide.

4.3 SPH Occurrence

SPH has been measured consistently in two of the Site monitoring wells, MW-20 and D-13 (**Table 2**). The inferred extent and thickness of SPH measured on November 13, 2023, is depicted on **Figure 6A** and **6B**. The greatest measured thickness of SPH in 2023 was in well D-13, which is situated in the southeastern corner of the Property. A graph of SPH thickness versus depth to groundwater in well MW-20 is provided in **Appendix F**. Fluctuations in groundwater levels appear to affect the SPH thickness, (e.g., as groundwater levels rise, LNAPL thickness decreases). Historically, up to 0.41 feet of SPH has been measured in MW-20 and 0.5 feet in D-13. During quarterly monitoring in 2023, SPH ranged in thickness from 0.01 feet to 0.03 feet at MW-20 and 0.01 to 0.46 feet at D-13.

5. Analytical Results and Conceptual Site Model

The RI analytical testing was performed in accordance with the AO, the RI Work Plan, multiple supplemental work plans and/or work plan addendums, the QAPP, and the SAP (**Appendix E**) (Ecology, 2009; SAIC, 2010, 2013; Leidos, 2015, 2016, 2018, 2020). Soil and groundwater samples were submitted to ELLE, an Ecology-accredited laboratory. The RI analytical data that was acquired prior to 2023 is presented in **Appendix D,** where data is available and if not previously submitted. The 2023 groundwater analytical data was validated by an AECOM Chemist and no data quality issues were identified. The validation report and the laboratory analytical reports are included in **Appendix F**.

The current and previous soil and groundwater analytical results are compared to the MTCA Method A CULs, and application of MTCA Methods for this Site are further discussed in Section 5.5.

5.1 Soil

The petroleum hydrocarbon distribution in soil, based on earlier Site investigations (1984 through 2001), is depicted on **Figure 3A**. The TPH distribution in soil exceeding the MTCA Method A CULs based on additional Site characterization conducted between 2010 and 2021 is depicted on **Figure 3B** and the benzene distribution is shown on **Figure 3C**. The previous analytical results are presented in **Appendix A**, previous figures are included in **Appendix B** and available laboratory reports are included in **Appendix D** (if not previously submitted).

Petroleum hydrocarbon concentrations exceeding MTCA Method A CULs varied across the Property and ranged from 2 to 11 feet bgs. Petroleum hydrocarbons exceeding MTCA Method A CULs also appear to extend off-Property to the northwest, south and west (**Figure 3B**) at depths ranging from 2 to 8 feet bgs. The western off-Property area of contamination was noted to be slightly deeper ranging from 5.5 to 11.5 feet bgs.

5.2 Groundwater

Groundwater monitoring has been performed periodically at the Site since 1984. Historical groundwater analytical results are provided in **Appendix A**. Recent groundwater analytical results from 2023 are summarized in **Table 2**. Groundwater concentrations exceeding MTCA Method A CULs from monitoring wells in the perched GWBU and deeper sand aquifer are shown on **Figure 6A** and **Figure 6B**, respectively. The 2023 data indicated that the perched GWBU had exceedances of TPH-g, TPH-d, and TPH-o across the Property and off-Property to the northwest, north and east. The 2023 data for the sand aquifer indicated that the exceedances were primarily TPH-d and TPH-o and appear to extend off-Property to the north, west and east. COCs in the deeper well (D-14), screened from 29 to 32 ft bgs, continue to be non-detect or below the CULs indicating that vertical migration of dissolved-phase hydrocarbons does not appear to have significantly occurred.

Laboratory analyses conducted in 2023 indicate that petroleum source areas at the Site are highly weathered and degraded, and that a minimal portion of the reported TPH-d and TPH-o at the Site are petroleum hydrocarbons. In 2023, silica gel cleanup was performed prior to analyses on a subset of split TPH-d and TPH-o samples to determine the portion of non-petroleum compounds that have oxygen in their molecular structures. These oxygen containing compounds, i.e., polar metabolites, are non-petroleum hydrocarbons that remain and continue to degrade following the biodegradation of a petroleum source, which result in a reduction in the toxicity of the overall mixture over time. In 2023, Ecology set separate CULs for both the polar metabolite fraction and the petroleum fraction (Ecology, 2023).

The results of sampling with and without silica gel cleanup are summarized in **Table 2**. To calculate the polar metabolite and petroleum fractions, the TPH-d and TPH-o concentrations are first combined for both the with and without silica gel cleanup analytical results. The concentrations of polar metabolites were calculated by then subtracting out the concentrations removed with silica gel cleanup for each sample with and without silica gel cleanup sample analysis pair, with the removed fraction representing polar metabolites and the remainder representing the petroleum fraction. These analyses showed that greater than 90% of the TPH-d and TPH-o mass reported in all samples is attributed to polar metabolites. The petroleum fraction of TPH-d and TPH-o exceeded the MTCA Method A CULs in just four samples. The polar metabolite fraction exceeded the CULs in 50 samples over two sampling events.

5.3 Conceptual Site Model (CSM)

The CSM identifies suspected sources of hazardous substances/petroleum products, the types and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors. An updated CSM was prepared for the Site, and is shown graphically in **Appendix G**. The suspected sources of contamination at the Site are associated with releases at the former bulk fuel facility ASTs, USTs, piping, spills and garages (**Figure 2B**).Transport mechanisms identified at the Site include direct discharge of contaminants from past fuel storage operations to subsurface soil, migration from soil into groundwater, lateral groundwater flow/advection, SPH migration, and volatilization of petroleum hydrocarbons and other volatile contaminants from the soil and groundwater. Potentially complete pathways are primarily for potential exposure for current or future construction workers. Potentially complete exposure pathways for commercial worker exposure are from potential vapor inhalation and from potential dermal contact with, or ingestion of soil and/or groundwater.

The CSM will be used in the development of appropriate remedial alternatives and selection of a preferred cleanup action for the Site.

5.3.1 Source Characterization and Constituents of Concern

Primary soil COCs have been identified for the Site based on known historical use as a bulk fuel terminal, previous analytical results (**Appendix A**) and current groundwater analytical results (**Table 2**). COCs include BTEX constituents, TPH-g, TPH-d, and TPH-o, and several sources of soil and groundwater contamination have been identified at the Site. Previous soil analytical results (**Appendix A**) indicate TPH-o is generally limited to the southeastern portion of the Site while TPH-g and TPH-d are present in soil over most of the Property and extend off-Property to the north, west, and south (**Figure 3A, 3B,** and **3C**). Soil contamination is limited to depths between approximately 2 and 11.5 feet bgs.

Primary groundwater COCs have been identified as TPH-g, TPH-d, and TPH-o within the perched GWBU, and as TPH-d and TPH-o within the sand aquifer unit based on current groundwater analytical data (**Table 2**). BTEX constituents were historically above MTCA Method A CULs at some wells within the perched GWBU and the sand aquifer unit (**Appendix B**), however, no BTEX constituents have been detected above the respective CULs since at least 2014 (Leidos, 2014). Groundwater COCs exist above MTCA Method A CULs over most of the Property and generally extend off-Property to the north, west, and east in wells within the perched GWBU and the sand aquifer (**Figured 6A** and **6B**). As indicated above, significant differences in results between samples analyzed with and without silica gel cleanup for TPH-d and TPH-o indicate that petroleum in groundwater is highly weathered. The low concentrations of TPH-d and TPH-o detected following silica gel cleanup indicate there is minimal remaining petroleum contamination. The fraction removed by silica gel cleanup, which is greater than 90% of the TPH-d and TPH-o mass detected in all samples on average, is attributed to polar metabolites, which remain following the biodegradation of a petroleum source (Ecology, 2023). There were significantly more exceedances of the polar metabolite CULs than the petroleum TPH-d+o MTCA Method A CUL (50 polar metabolite vs 4 petroleum exceedances) in 2023, which is indicative of a highly weathered and degraded petroleum source. The lack of polar organic compounds in some background groundwater samples indicate that the presence of natural organic (non-petroleum/biogenic) constituents may be minimal.

SPH is regularly detected at wells MW-20 and D-13 with apparent increases in thicknesses in well MW-20 correlating with relatively lower groundwater elevations (from 2010 through 2016), (**Appendix H**). The relationship between groundwater elevations and product thicknesses suggests that SPH may be displaced laterally as the water table rises, causing a decrease in apparent SPH thickness. SPH that is either displaced or entrapped in the vadose zone could continue to be an ongoing source for apparent short-term changes in the dissolved phase groundwater contamination within the GWBU (ITRC 2018b). However, over the long-term, SPH thicknesses have exhibited a decreasing trend with measured thicknesses not exceeding 0.05 feet since at least 2020 at MW-20. SPH trend data for well D-13 are limited and will continue to be evaluated to determine the relationship between groundwater elevations and apparent SPH thickness.

Maximum measured thicknesses through 2023 were 0.04 feet and 0.46 feet at MW-20 and D-13, respectively.

A generally stable, or no discernable trend is apparent for the dissolved-phase COC plume within the perched GWBU and sand aquifer. However, seasonal groundwater elevation fluctuations and/or tidal influences may affect observed variable results over time. It is noted that observed trends in concentrations over the last three years are generally stable to decreasing over time. COC concentration versus groundwater elevation trend graphs for select wells (MW-10, MW-21, MW-23, D-3A, D-6, D-7, and D-8) are presented in **Appendix H**. Groundwater trends will continue to be monitored and a further analysis of contaminant degradation will be provided in the Final RI Report, the FS, and/or during assessment of an appropriate remedial path forward.

5.3.2 Contaminant Fate and Transport Mechanisms

A release of petroleum hydrocarbons will migrate vertically and laterally by various mechanisms including gravity-driven overland flow, advection, dispersion, water-driven flow, and groundwater flow, dependent on the properties of the released petroleum hydrocarbon (viscosity, density, surface tension), soil properties (porosity, pore size distribution, connected pore space, and moisture level), and interface properties (surface tension, sorption, and molecular forces) (ITRC 2018a). Generally, the hydrogeologic characteristics of a site control the fate and transport of contaminants, particularly the migration of SPH and dissolved phase hydrocarbons in groundwater.

BTEX constituents, TPH-g, TPH-d, and TPH-o are present in soil from releases during historical operations of the bulk fuel terminal. The perched GWBU generally consists of 3 to 6 feet of dredged fill material characterized by fine sand with varying amounts of gravel, shell fragments, bricks, and wood. The sand aquifer consists of fine to medium sand approximately 20 feet thick and is at least partially confined by an overlying silt unit (GeoEngineers, 1993). Aquifer characteristics were evaluated in 1992 and the hydraulic conductivity of the perched GWBU was found to range between 1.1×10^{-4} and 1.6×10^{-2} centimeters per second (cm/sec) and in the sand aquifer between 6.2×10^{-4} and 2.4×10^{-2} cm/sec (GeoEngineers, 1993). Following a release, petroleum hydrocarbons migrate through the vadose zone to groundwater by infiltration and percolation and once in the water table, petroleum hydrocarbons are transported by advective groundwater flow. The 2023 groundwater analytical data (**Table 2**) indicates the known current lateral extent of the dissolved-phase petroleum hydrocarbon plume is located within most of the Property and extends off-Property to the north, west, and east (**Figure 6A** and **Figure 6B**). The southern and northern extent of the dissolved-phase groundwater plume within the perched GWBU and the sand aquifer is currently unknown and additional monitoring wells will be required to further evaluate the full extent of the groundwater plume.

5.3.3 Exposure Pathways and Potential Receptors

Human and ecological receptors may be exposed to COCs through different environmental media (air, water, soil) and through different routes of exposure (generally ingestion, inhalation, and dermal adsorption). Potential receptors should be evaluated based on current and reasonably anticipated future land use. Exposure pathways are the way a potential receptor may come into contact with a COC and can include, but not be limited to direct contact, leaching from soil to groundwater, runoff to surface water, dispersion of dust in the air, and volatilization to outdoor or indoor air.

The Site is in an industrial area and is currently used by GEO Group as transportation offices, bus and employee parking for the adjacent Northwest Detention Center and no changes in land use are anticipated (Leidos, 2014). Additionally, a Warranty Deed, which prohibits residential uses of the Property, were placed on the Site in 1999 as an agreement between Chevron and the purchaser (Warranty Deed, 1999). The Warranty Deed and associated restrictions are applicable to each successor, assignee, or lessee of the property. Therefore, land use is anticipated to remain industrial (Warranty Deed, 1999).

Current and future potential receptors, exposure pathways, and exposure routes for contamination are summarized in the CSM that was updated in 2023 (**Appendix G**) and by specific exposure media.

5.3.3.1 Soil

The updated CSM determined the direct contact and incidental ingestion pathways for residential and recreational/trespasser scenario are not likely a risk or regulatory concern for soil at the Site since the property is fenced and not used for residential (and restrictive covenants prohibiting residential use of the property are in place) or recreational activities. However, the direct contact exposure and incidental ingestion pathways for the construction worker scenario are potential pathways of concern. Petroleum contaminated soil remains at the Site from approximately 2 to 11.5 feet bgs creating a potential risk of direct exposure for construction workers.

5.3.3.2 Groundwater

Groundwater has been affected by the migration of contamination into the saturated zone soils. Potential exposure pathways for groundwater contamination include volatilization into soil vapor and subsequent exposure through the vapor pathway or via the direct contact pathway (dermal exposure or ingestion). Groundwater in the Property area is not used for drinking water and no potable water supply wells were identified in the Property vicinity. Future utility earthwork at the Property could result in exposure to contaminated groundwater by construction workers during the excavation of saturated zone soils and/or by contact with contaminated water.

5.3.3.3 Soil Gas/Air

The updated CSM determined that contaminated soil gas associated with the soil and groundwater contamination could pose a vapor intrusion risk into existing structures and to construction workers performing subsurface work. Vapor intrusion risks will be assessed through the collection of soil gas and sub-slab vapor samples in the existing on-Property office building, if deemed necessary following an inspection of the building construction.

5.3.4 Terrestrial Ecological Evaluation (TEE)

This section documents the TEE analysis and basis for conclusions performed for the Site. The TEE Form is presented in **Appendix I.** AECOM reviewed the previously completed TEE in the Draft RI (Leidos, 2014), the current Site conditions, anticipated future use, and the existing soil data. MTCA requires an evaluation of the potential impact for the COCs on terrestrial ecological receptors in accordance with the procedures outlined in WAC 173-340-7490.

Under WAC 173-340-7491, a site may be excluded from the TEE requirement if any of the following criteria are met:

1. Point of Compliance: WAC 173-340-7491(1)(a) - All soil contaminated with hazardous substances is, or will be, located below the points of compliance (POC):
    a. All soil contamination is, or will be, at least 15 feet below the surface.
    b. All soil contamination is, or will be, at least 6 feet below the surface, and institutional controls are used to manage remaining contamination.
2. Barriers to Exposure: WAC 173-340-7491(1)(b) - All soil contaminated with hazardous substances is, or will be, covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination, and institutional controls are used to manage remaining contamination.
3. Developed Land: WAC 173-340-7491(1)(c) - Where the site conditions are related or connected to undeveloped land in the following manner:
    a. For sites contaminated with hazardous substances other than those specified in WAC 173-340-7491(c)(ii), there is less than 1.5 acres of contiguous undeveloped land on the site or within 500 feet of any area of the site.
    b. For sites contaminated with any hazardous substances specified in WAC 173-340-7491(c)(ii), there is less than ¼ acre of contiguous undeveloped land on or within 500 feet of any area of the site affected by these hazardous substances.

4. Background Concentrations: WAC 173-340-7491(1)(d) - Concentrations of hazardous substances in soil do not exceed natural background levels, as determined under WAC 173-340-709.

The Site does not meet the above-listed criteria for TEE exclusion. Therefore, a simplified TEE was completed for the Site. Under WAC 173-340-7492, a site does not require further evaluation if any of the following criteria are met:

1. Exposure Analysis: WAC 173-340-7492(2)(a) – Either or both of the following conditions are met:
    a. Area of contamination at the Site is not more than 350 square feet.
    b. Current or planned land use makes wildlife exposure unlikely (based on Table 749-1).
2. Pathway Analysis: WAC 173-340-7492(2)(b) – No potential exposure pathways from soil contamination to ecological receptors.
3. Contaminant Analysis: WAC 173-340-7492(2)(c) – Any of the following conditions are met:
    a. No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations that exceed the values listed in Table 749-2.
    b. No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations that exceed the values listed in Table 749-2, and institutional controls are used to manage remaining contamination.
    c. No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays.
    d. No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays, and institutional controls are used to manage remaining contamination.

The simplified TEE determined wildlife exposure to contamination is unlikely based on WAC 173-340-7492(2)(a), Table 749-1 (**Table 4**). Thus, no further ecological evaluation is necessary.

5.4 Proposed Cleanup Standards

Cleanup standards proposed for the Site were derived in accordance with WAC 173-340-700 and consist of the following: (a) Selecting CULs for hazardous substances present at the site, (b) Identifying the location where these cleanup levels must be met (point of compliance), and (c) Other regulatory requirements that apply to the site because of the type of action and/or location of the site ("applicable state and federal laws").

The MTCA process for establishing cleanup levels begins with identifying the nature of the contamination, the potentially contaminated media, the current and potential pathways of exposure, the current and potential receptors, and the current and potential land and resource uses (WAC 173-340-700[5]). CULs are established for each media impacted (i.e., soil, groundwater, and other media) and are selected to be protective of human health and the environment, in accordance with MTCA cleanup regulations (WAC 173-340). The nature of the contamination, the potentially contaminated media, the current and potential pathways of exposure, the current and potential receptors, and the current and potential land and resource uses (WAC 173-340-700[5]) were evaluated as part of the cleanup standard selection process. CULs were established based upon the protection of human health, as the TEE (Section 5.3.4) determined that exposure to wildlife is unlikely at the Site. CULs were derived based upon the Property and surrounding parcels being zoned for industrial use and are anticipated to remain so for the foreseeable future.

In determining the most applicable Site-specific MTCA Method CULs, the following will be considered:

- Size of the Site and identified constituents of interest (COIs) for soil and groundwater.
- Current and reasonably anticipated future Site use.
- Groundwater status within the Site aquifer(s).

- Interaction between contaminated soil and groundwater.

5.4.1 Applicable or Relevant and Appropriate Requirements (ARARs)

The RCW 70.105D.030(2)d requires cleanup standards to be “at least as stringent as all applicable state and federal laws.” Applicable or Relevant and Appropriate Requirements (ARARs) proposed and/or selected for the Site. The cleanup standards set forth in MTCA Cleanup Regulations (WAC 173-340) for soil, groundwater, and other media (indoor/ambient air, soil gas, sub-slab soil gas) are proposed for adoption at the Site.

Additional ARARs will be evaluated during the development of the FS. These ARARs often include permitting tied to the construction and implementation of remedial actions. Potential regulatory requirements could include the following:

- Clean Water Act (33 United States Code [USC] Section 1251)
- State Environmental Policy Act (SEPA) (RCW 43.21C and WAC 197-11)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (40 Code of Federal Regulations [CFR] Subchapter J)
- Resource Conservation and Recovery Act regulations for waste generation, transportation, and disposal (WAC 173-303, WAC 173-350).
- Solid Waste Management Chapter 43.21 RCW, Minimum Functional Standards for Solid Waste Handling (WAC 173-304)
- Washington Hazardous Waste Management Act (RCW 70.105; WAC 173-303)
- Washington Water Pollution Control Act (Chapter 90.48 RCW; Chapter 173-201A WAC; Chapter 173-200 WAC)
- Occupational Safety and Health Act (OSHA) (Part 1910 of Title 29 of the Code of Federal Regulations [29 CFR 1910])
- General Occupational Health Standards and Safety Standards for Construction Work (WAC 296-62 and 296-155)
- Minimum Standards for Construction and Maintenance of Wells (WAC 173-160)
- Underground Utilities, RCW 19.122.010, General Protection Requirements (WAC 296-155-655).
- Coverage under the general construction stormwater National Pollutant Discharge Elimination System (NPDES) permit.
- City permit requirements (e.g., grading permit, shoreline management permit).

5.4.2 Soil CULs

Site-specific MTCA CULs for soil were evaluated in 2014 and modified MTCA Method C CULs were proposed for soil since they can be applied to industrial sites and reasonably anticipated future Site use is to remain as industrial (Leidos, 2014). A direct contact CUL of over 50,000 mg/kg for total TPH was calculated using the Ecology Workbook for Calculating Cleanup Levels for Petroleum Contaminated Sites (MTCATPH Version 11) (**Appendix J**). Since the calculated CUL exceeds residual soil saturation values (WAC 173-340-747.55), modified MTCA Method C CULs were proposed for TPH-g, TPH-d, and TPH-o based on the residual soil saturation values for medium- to coarse- sand, summarized as follows (Leidos, 2014; Ecology, 2001):

- TPH-g: 3,266 mg/kg
- TPH-d: 7,742 mg/kg
- TPH-o: 17,419 mg/kg

However, the proposed soil CULs may require restrictions to be placed on the Property to ensure future protection of human health and the environment (Leidos, 2014). Since additional restrictions with the State have not yet been placed on the Property (only Warranty Deed related to conditions of original sale), further evaluation may be necessary to determine the appropriate Site-specific soil CULs. A comparison of potentially applicable existing soil CULs for Site COIs as an alternative to those proposed in 2014 is presented below:

Commented [TP7]: This section of the RI Report should include your proposed CULs; it is unclear what CULs you are suggesting from this discussion. There should also be some inclusion on the table of background levels and PQLs.

COI	MTCA Method A CUL Unrestricted Land Use (mg/kg)	MTCA Method B CUL Direct Contact – Cancer (mg/kg)	MTCA Method B CUL Direct Contact-Noncancer (mg/kg)	Protective of Groundwater CUL–Saturated (mg/kg)
Benzene	0.03	18	320	0.0017
Toluene	7	NCE	6,400	0.27
Ethylbenzene	6	NCE	8,000	0.34
Total Xylenes	9	NCE	16,000	0.83
TPH-g	30*	NCE	NCE	NCE
TPH-d	2,000	NCE	NCE	NCE
TPH-o	2,000	NCE	NCE	NCE

Notes:
*Two TPH-g CULs exist, one for use when benzene is detected and one when benzene is not detected. The more conservative value is presented on the table.
µg/L = micrograms per liter
NCE = no CUL established

5.4.3 Groundwater CULs

Since groundwater within the perched GWBU and sand aquifer is considered non-potable, alternative groundwater CULs will likely be appropriate for the Site, however, other factors will be considered during development of groundwater CULs. A comparison of potentially applicable existing groundwater CULs for Site COIs is presented below:

COI	MTCA Method A CUL (µg/L)	MTCA Method B CUL Cancer (µg/L)	MTCA Method B CUL Noncancer (µg/L)	MTCA Method B CUL Potable Groundwater (µg/L)
Benzene	5	0.8	32	5
Toluene	1,000	NCE	640	640
Ethylbenzene	700	NCE	800	700
Total Xylenes	1,000	NCE	1,600	1,600
TPH-g	800*	NCE	NCE	NCE
TPH-d	500	NCE	NCE	NCE
TPH-o	500	NCE	NCE	NCE

Notes:
*Two TPH-g CULs exist, one for use when benzene is detected and one when benzene is not detected. The more conservative value is presented on the table.
µg/L = micrograms per liter
NCE = no CUL established

MTCA Method A, MTCA Method B, other CULs, or a combination of multiple CULs may be appropriate for groundwater at the Site. Potentially applicable CULs will continue to be evaluated and final Site-specific CULs will be presented in the Final RI/FS. MTCA Method A CULs will be used for groundwater at the Site until final Site-specific CULs are established.

Commented [TP8]: Similar to the prior comment; there needs to be a proposed CUL for this section, as well as some comparison to background levels and PQLs.

5.4.4 Cleanup Standards for Other Media (Indoor/Ambient Air, Soil Gas, Sub-Slab Soil Gas)

For the vapor intrusion (VI) exposure pathway, acceptable air quality occurs when the contribution from VI and any emissions from site remediation activities do not exceed the appropriate Method B or Method C air cleanup levels. Based upon the Property status, Method C (industrial) air CULs are proposed for the property. In general, soil cleanup levels established to be protective of groundwater and groundwater CULs established to be protective of beneficial use are considered sufficiently protective of the VI pathway. Screening levels and cleanup levels for the Property can be in accordance with Ecology's Vapor Intrusion Guidance (Ecology, 2022). Additional Tier 1 and Tier 2 VI evaluations would utilize MTCA Method C Groundwater and Soil-Gas Screening levels to determine if the following indoor air CULs could be exceeded:

COI	MTCA Method C Indoor Air Cleanup Levels ($\mu g/m^3$)
Benzene	0.32
Naphthalene	0.074
TPH	46 or a site-specific determination

5.4.5 Points of Compliance (POC)

The POC is the point or points on a site where CULs must be met and may include both standard and conditional POCs, defined as follows (Ecology, 2013)

- The **standard POC** for each medium is generally defined as "throughout the site." Unless a site qualifies for a conditional POC, CULs must be met at the standard POC for each media.
- The **conditional POC** is defined as a less stringent POC for certain media that may only be established if certain specified conditions are met. Under a conditional POC, any contamination remaining on-site must be contained within a specified area that protects humans and ecological receptors from exposure to the contaminants.

Groundwater POCs for the Site are identified as the standard POCs, in which CULs must be met throughout the Site. Since the potential for direct contact with human receptors when soil is disturbed could not be eliminated as a potential exposure pathway, the POC for soil is identified as the standard POCs from ground surface to 15 feet bgs.

5.5 Data Gaps

Several of the additional site characterization elements proposed in the Ecology-approved 2020 RI Work Plan (Leidos, 2020) were not implemented due to various logistical and access issues. The proposed scope of the 2020 RI field work included additional shallow and deep monitoring wells and soil borings as shown on **Figure 7**. Based on AECOM's assessment of the CSM and recent groundwater data, revisions to the 2020 investigation scope are proposed to address identified data gaps and prior investigation objectives as summarized below.

Commented [TP9]: I am not finding any analytic data for the testing of EDC/EDB or naphthalene in the GW in Appendix A or in the 2023 data.

5.5.1 Groundwater

The extent of the dissolved-phase COC plume has not been fully delineated within the perched GWBU or the sand aquifer. Seven nested well pairs were proposed but were not installed, including: northwest and northeast of the Richlite property (MW-35/D-23 and MW-40/D-28), to the south on the BNSF property (MW-27/D-11 and MW-28/D-16), and to the northwest adjacent to the waterway (MW-33/D-21). **Figure 7** shows the previously proposed groundwater monitoring well locations (Leidos, 2020). Based on the latest groundwater data from November 2023, the following modifications to the previous work plan are proposed and are shown on **Figure 8**:

Commented [TP10]: All proposed actions from the RIWP need to be completed before the submittal of a draft RI. A draft RI should propose a complete site characterization. If the site is not fully characterized, there needs to be a proposed amendment to the RIWP and a schedule extension.

- Eliminate proposed nested wells MW-35/D-23 as 2023 groundwater data indicated that the limits of the plume have been delineated to the northeast by MW-31/D-19 and MW-36/D-24.

- Move nested wells MW-40/D-28 approximately 100 to 150 feet to the northeast along the Richlite northern property boundary.
- Eliminate shallow monitoring well MW-33 from the nested well pair as the plume has been defined to the west based on MW-23 and MW-24. Proceed with deeper well D-21 near the Wheeler-Osgood waterway once the BNSF access agreement is in place.
- Move nested wells MW-27/D-11 approximately 100 to 200 feet to the west onto the Steeler property to better defined the southwestern limits of the plume.
- Move nested wells MW-28/D16 from the BNSF property to the southeast corner of the Property for plume delineation and to facilitate access for future sampling.
- Add another set of nested wells (MW-33/D-23) on the Steeler property to the west of MW-25/D-10 for delineation of groundwater in the western direction.

Commented [TP11]: If you move these wells, Ecology is concerned about the gap between D-21 and MW-40/D-28. Ecology is asking you to consider additional nested wells somewhere on the Berry Global property north/northwest of the Site.

Commented [TP12]: Did you mean MW-34?

Commented [TP13]: Ecology is not satisfied with how the plume has been delineated upstream and moving this well would leave the upgradient end of the plume unresolved, especially if MW-27 and D-11 are also moved. Both Figure 6A/B show dashed lines to the southwest, not just the south/southeast.

5.5.2 Soil

Additional delineation of petroleum hydrocarbons to the south (BNSF property) was proposed and was contingent on obtaining an access agreement from BNSF. Nine additional soil borings (OB-9 through OB-17) were proposed along the former rail spur and to south on BNSF property (**Figure 7**). If soil impacts are not apparent in the initial four soil borings (OB-9 to OB-12) completed along the former rail spur, no additional borings are warranted. However, if impacts are apparent, then step-out soil borings will be conducted. The revised initial boring locations are shown on **Figure 8**.

5.5.3 Soil Gas/Air

Currently, only one building is present on the Property which is used as an office and is assumed to be slab-on-grade construction. No prior soil gas or VI assessment has been identified for the Property. The office building is located adjacent to well D-13 which regularly contains SPH. Thus, potential VI concerns may exist for the building and soil gas testing is proposed in areas with measurable SPH (e.g., around wells D-13 and MW-20) to evaluate if soil gas screening levels for petroleum hydrocarbon related VOCs have been exceeded and warrant further assessment. This soil gas assessment will be conducted in accordance with Ecology's guidance for evaluating VI (Ecology, 2022).

5.5.4 Tidal Influence Study

Since the tidal influence study was completed in 2016, new wells have been added to the Site monitoring well network, and additional wells are proposed. Further assessment of tidal influences on the Site groundwater flow is proposed to better understand the relationship between groundwater flow and tidal fluctuation and the distribution of dissolved phase contamination within the shallow and deep groundwater zones. The tidal study design will be developed following the installation of the new monitoring wells as needed.

Additional RI activities for the Site will focus on filling these identified data gaps to better characterize the sources of contamination and develop an effective FS and future remedial strategy.

6. Conclusions and Recommendations

AECOM updated the RI to include the most recent groundwater monitoring data and an updated CSM. Prior and recent soil and groundwater data indicates that the COCs associated with the former bulk fuel terminal are BTEX, TPH-g, TPH-d, and TPH-o. The extent of soil and groundwater contamination is summarized as follows:

- Soil contamination extends over most of the Property and off-Property to the northwest, west, and south at depths from approximately 2 to 11.5 feet bgs (**Figures 3A, 3B,** and **3C**) based on soil analytical results collected between 1990 and 2021.

- The extent of the dissolved-phase hydrocarbon plume is not fully defined in either the perched GWBU or in the sand aquifer. The plume extends across most of the Property in both the perched GWBU and the sand aquifer. Additional groundwater monitoring wells are warranted to the north, southeast, and west to further evaluate the extent of contamination within the perched GWBU, and to the north, northwest, and south to further evaluate the extent of contamination within the sand aquifer (**Figures 6A** and **6B**).
- The Leidos RI Work Plan (July 2020) included several additional monitoring wells which were not installed during the last phase of investigation work due to logistical issues (**Figure 7**). Based on review of the recent groundwater analytical data and updates to the CSM, modifications to the proposed monitoring well locations (**Figure 8**) are as follows:
    - Eliminate proposed nested wells MW-35 and D-23 as 2023 groundwater data indicated that the limits of the plume have been delineated to the northeast by MW-31/D-19 and MW-36/D-24.
    - Move nested wells MW-40/D-28 approximately 100 to 150 feet to the northeast along the Richlite northern property.
    - Eliminate shallow monitoring well MW-33 from the nested well pair as the plume has been defined to the west based on MW-23 and MW-24. Proceed with D-21 near the Wheeler-Osgood Waterway once the BNSF access agreement is in place.
    - Move nested wells MW-27/D-11 approximately 100 to 200 feet to the west onto the Steeler property to better defined the southwestern limits of the plume.
    - Move nested wells MW-28/D16 from the BNSF property to the southeast corner of the Property for plume delineation and to facilitate access for future sampling.
    - Add another set of nested wells (MW-33/D-23) on the Steeler property to the west of MW-25/D-10 for delineation of groundwater in the western direction.
- The 2020 RI Work plan included additional delineation of petroleum hydrocarbons in soil and groundwater to the south (BNSF property) of the Property. Nine soil borings (OB-9 through OB-17) were initially proposed along the former rail spur and further south on BNSF property (**Figure 7**). AECOM instead proposes to complete four initial soil borings (OB-9 to OB-12) along the former rail spur and assess if additional borings are necessary to evaluate the extent of any impacts. The initial borings are shown on **Figure 8**.
- SPH is regularly detected at wells MW-20 and D-13 (**Appendix H)**. SPH thicknesses have exhibited a decreasing trend with measured thicknesses not exceeding 0.05 feet since at least 2020 at MW-20. SPH trend data for well D-13 are limited and will continue to be evaluated to determine the relationship between groundwater elevations and apparent SPH thickness. Maximum measured thicknesses through 2023 were 0.04 feet and 0.46 feet at MW-20 and D-13, respectively. Transmissivity testing may be conducted to assess recoverability of SPH from these wells.

The Site did not meet the requirements for TEE exclusion and a simplified TEE was completed using WAC 173-340-7492, Table 749-1 (**Table 4**) (Leidos 2014). Based on the results in **Table 4**, the Site does not pose a threat of adverse effects to terrestrial ecological receptors, therefore, no further TEE is required. Additionally, Site-specific CULs will continue to be assessed as a remedial path forward is evaluated and a subsequent Final RI Report and FS is prepared.

Based on the information gathered to date during the prior RI activities, data gaps were identified which will require further site investigation and monitoring. The additional data gap assessment will include the following:

- Continue quarterly groundwater monitoring per the current schedule (**Table 1**). Results will be presented in quarterly groundwater monitoring reports.
- Proceed with advancing the additional groundwater monitoring wells as presented above to further define groundwater impacts in both GWBUs to Method A CULs.
- Proceed with advancing additional soil borings as indicated above and collection/analysis of soil samples to further define remaining soil impacts to Method A CULs.

- Evaluate if VI concerns exist at the Property, the scope of the VI assessment will be outlined in a work plan that will be prepared in conformance with Ecology's VI guidance (Ecology 2022).
- Conduct SPH transmissivity testing to assess product recovery rates if sufficient thicknesses persist for testing.
- Conduct further assessment of tidal influences on groundwater flow as needed following additional monitoring well installation and delineation.
- Once data gaps are addressed, prepare a Final RI Report that will include an FS that will assess remedial action alternatives and develop future cleanup actions for the Site.

Commented [TP14]: Ecology requires a specific schedule for these events to be included on the RIWP addendum.

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Figures

Tables

Appendix A

Previous Analytical Results

Appendix B

Previous Figures

Appendix C

Soil Boring and Monitoring Well Construction Logs

Appendix D

Laboratory Reports

Appendix E

Quality Assurance Project Plan and Sampling and Analysis Plan

Appendix F

2023 Data Validation Reports

Appendix G

Conceptual Site Models

Appendix H

Groundwater Trend Graphs

Appendix I

2023 Terrestrial Ecological Evaluation Form

Appendix J

Previous Cleanup Level Calculations

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